United States Department of Agriculture

Natural Resources Conservation Service

Arizona Basin Outlook Report January 1, 2005

Basin Outlook Reports and Federal - State - Private Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation and streamflow values are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

Issued by

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ARIZONA Water Supply Outlook Report
as of January 1, 2005

A full range of Snow Survey and Water Supply Forecasting products is available on the Arizona NRCS Home Page:

Snow Survey Program
http://www.az.nrcs.usda.gov/snow/index.html

Helpful Internet Sites

Defending Against Drought – NRCS
http://www.nrcs.usda.gov/feature/highlights/drought.html

- **Ideas on water, land, and crop management for you to consider while creating your drought plan.**

Arizona Agri-Weekly
http://www.nass.usda.gov/az/cur-agwk.pdf

- **Provides an overview of Arizona's crop, livestock, range and pasture conditions as reported by local staffs of the USDA's Agricultural Statistic Service and University of Arizona, College of Agriculture.**

SUMMARY

Data from high elevation NRCS SNOTEL sites, and the manually measured snow course network, show the statewide snowpack to be 113% of the 30-year average as of January 1. As a result of improving snow conditions throughout the mountains, water users can expect above-normal runoff this season for major tributaries covered in this report.

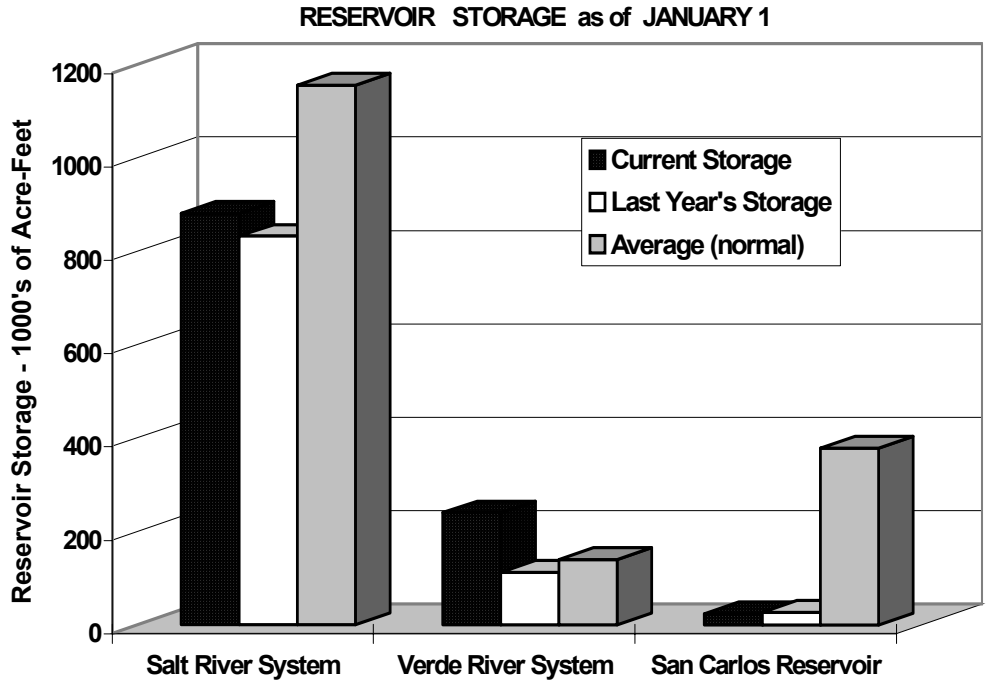
SNOWPACK

Watershed	Percent (%) of 30-Yr. Average Snowpack Levels as of January 1
Salt River Basin	84%
Verde River Basin	122%
Little Colorado River Basin	70%
San Francisco-Upper Gila River Basin	119%
Other Points of Interest	
Chuska Mountains	104%
Central Mogollon Rim	87%
Grand Canyon	85%
San Francisco Peaks	187%
Statewide Snowpack	113%

PRECIPITATION

Mountain data, from NRCS SNOTEL sites, shows that seasonal precipitation amounts are well above normal for this time of year. Please refer to precipitation bar graphs found in this report for more information.

RESERVOIR



Key storage volumes displayed in thousands of acre-feet (1000 x):

RESERVOIR	CURRENT STORAGE	LAST YEAR STORAGE	30-YEAR AVERAGE
Lyman Lake	2.6	2.0	14.1
Show Low Lake	2.8	3.1	3.1
Lake Pleasant	467.6	427.9	----
Lake Havasu	560.4	516.2	556.4
Lake Mohave	1632.6	1590.3	1596.6
Lake Powell	8664.0	11487.0	18933.0
Lake Mead	14355.0	15300.0	21775.0
Salt River System	880.4	832.5	1155.4
Verde River System	239.6	113.0	139.5
San Carlos Reservoir	24.1	27.3	379.1

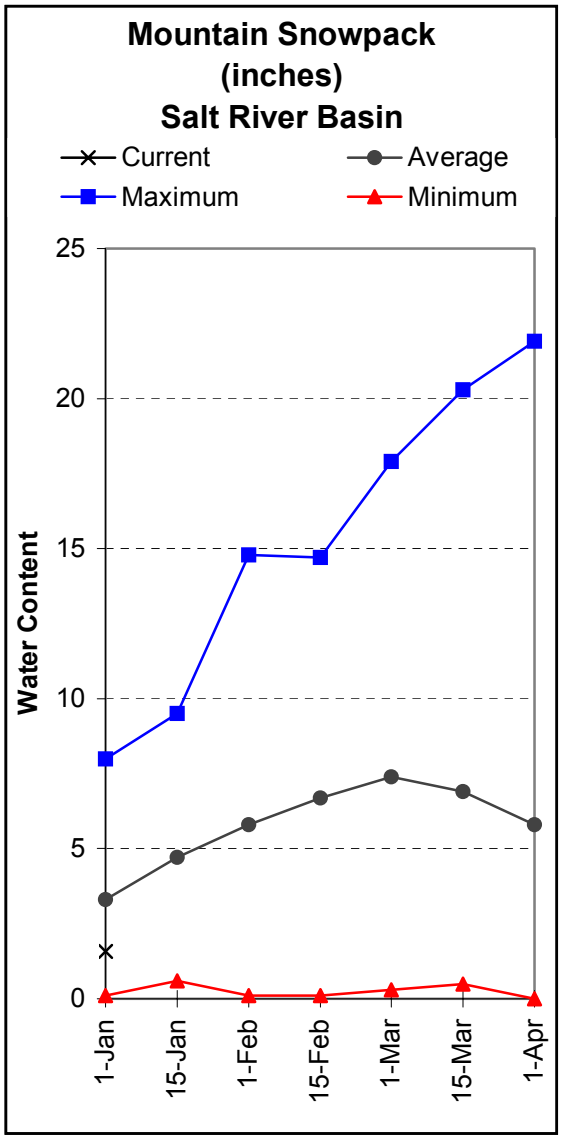
STREAMFLOW

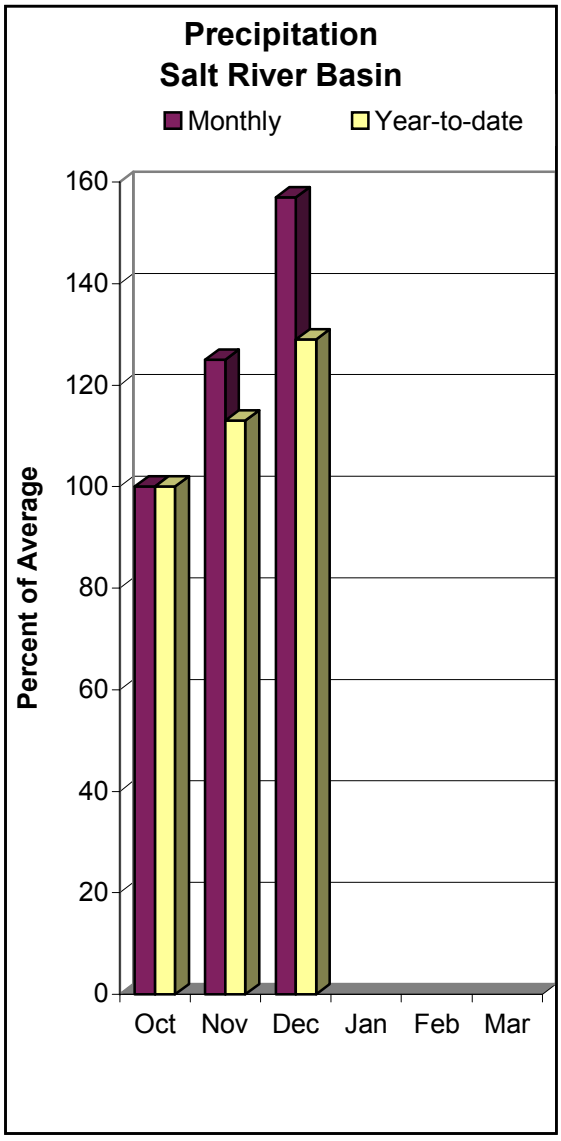
The long range forecast calls for above normal runoff this season as the result of abundant precipitation in Arizona's high country watersheds. Please refer to the basin forecast tables found in this report for more information.

SALT RIVER BASIN as of January 1, 2005

Near median streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 104 % of median streamflow levels through MAY, while at Tonto Creek, the forecast calls for 161 % of median streamflow levels through MAY.

Additionally, snow survey measurements show the Salt snowpack to be 84 % of the 30-year average, while combined reservoir storage in the Salt River system was reported at 880,400 acre-feet.





SALT RIVER BASIN
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions 50% (1000AF)	50% (% MED.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Salt River nr Roosevelt							
JAN-MAY	173	293	400	104	531	771	385
JANUARY	19.9	40	60	245	85	134	25
Tonto Creek ab Gun Creek nr Roosevelt							
JAN-MAY	24	57	90	161	135	223	56
JANUARY	7.33	18.99	30.00	509	43.52	68.00	5.90

* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1971-2000 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
(2) - The value is natural volume - actual volume may be affected by upstream water management.

SALT RIVER BASIN
Reservoir Storage (1000AF) End of December

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
SALT RIVER RES SYSTEM	2025.8	880.4	832.5	1155.4

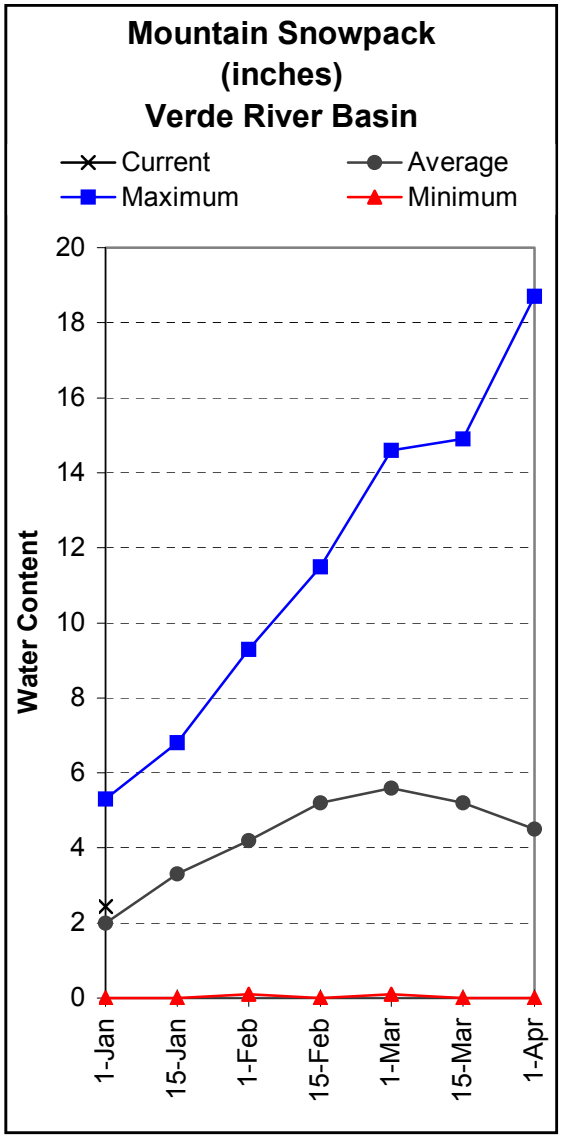
SALT RIVER BASIN
Watershed Snowpack Analysis - January 1, 2005

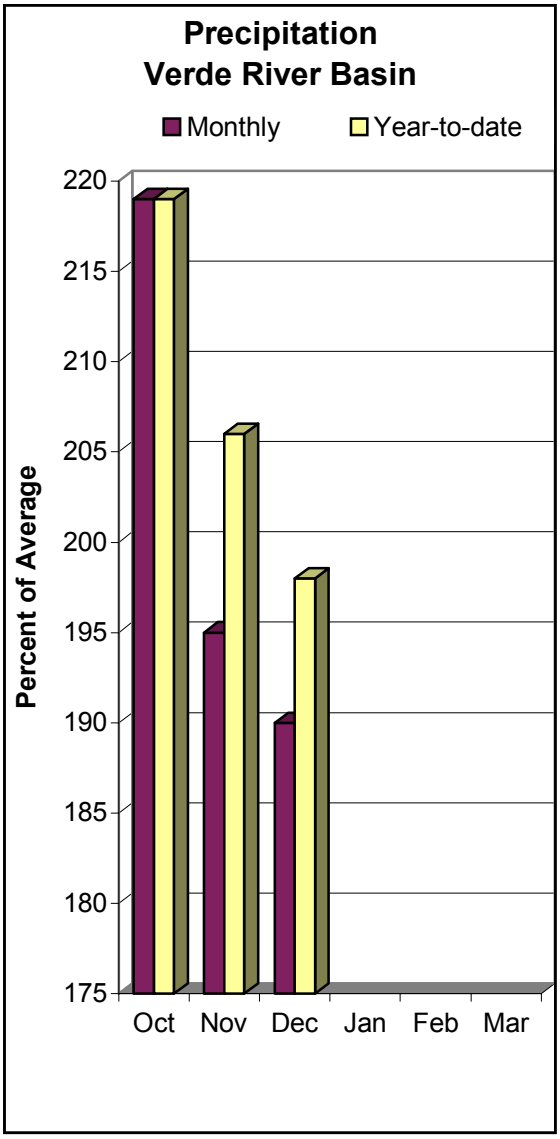
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
SALT RIVER BASIN	8	201	84

VERDE RIVER BASIN as of January 1, 2005

Well above median streamflow levels are forecast for the basin. In the Verde River, at Horseshoe Dam, the forecast calls for 193 % of median streamflow levels through MAY.

Furthermore, snow survey measurements show the Verde snowpack to be 122 % of the 30-year average, while combined reservoir storage on the Verde River system stands at 239,600 acre-feet.





VERDE RIVER BASIN
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (1000AF)	50% (% MED.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Verde River abv Horseshoe Dam							
JAN-MAY	194	317	425	193	555	790	220
JANUARY	72	114	150	625	193	269	24

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VERDE RIVER BASIN
Reservoir Storage (1000AF) End of December

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
VERDE RIVER RES SYSTEM	287.4	239.6	113.0	139.5

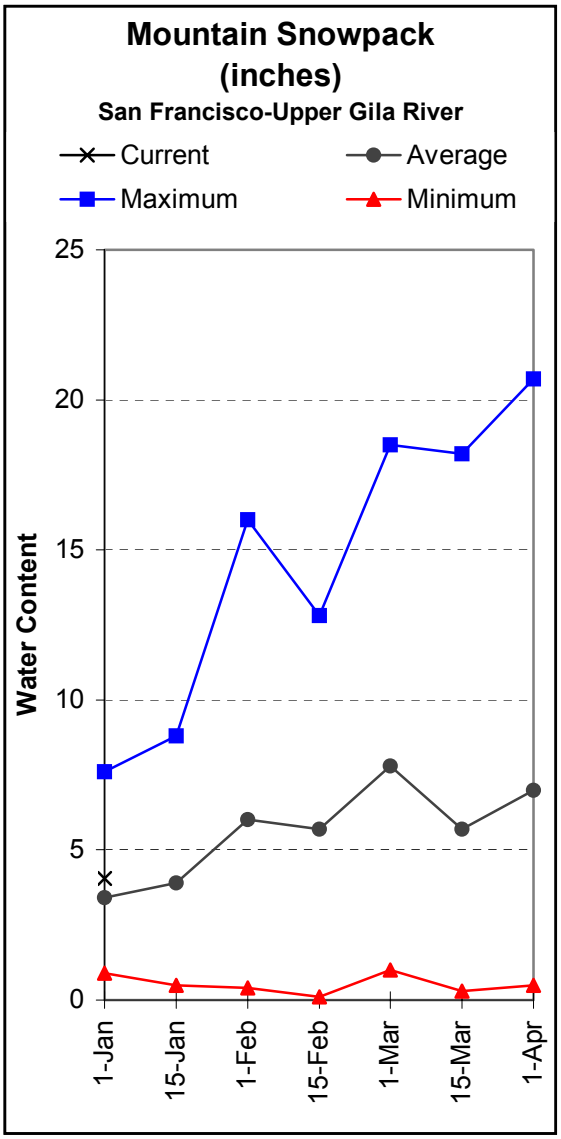
VERDE RIVER BASIN
Watershed Snowpack Analysis - January 1, 2005

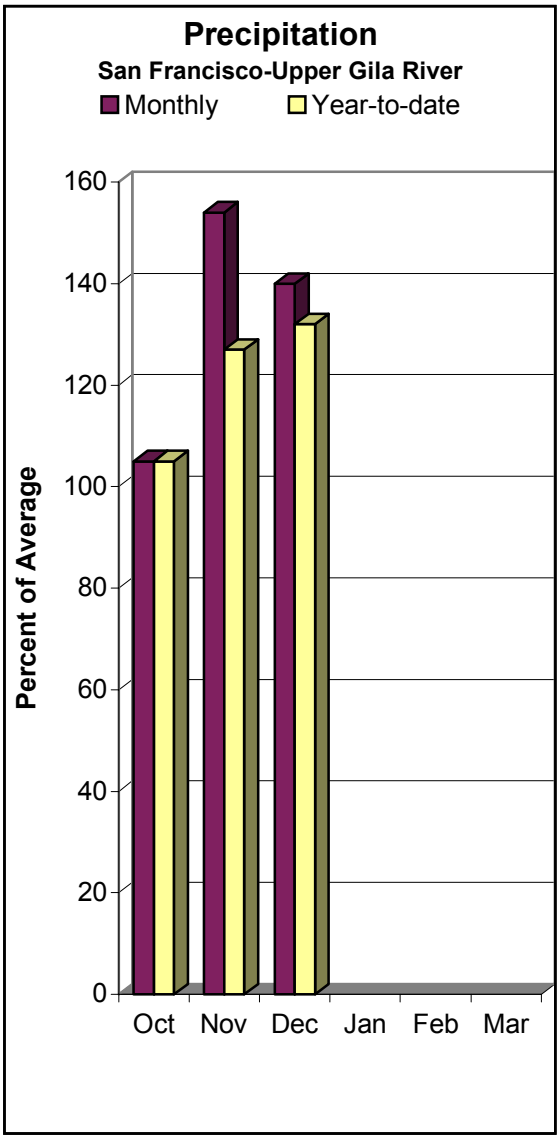
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
VERDE RIVER BASIN	10	279	122
SAN FRANCISCO PEAKS	3	387	187

SAN FRANCISCO-UPPER GILA RIVER BASIN as of January 1, 2005

Well above median streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 124 % of median streamflow levels through MAY, while in the Gila River, near Solomon, the forecast calls for 127 % of median streamflow levels through MAY. At San Carlos Reservoir, inflow into the lake is forecast at 167 % of median through MAY.

At San Carlos, reservoir storage stands at 24,100 acre-feet, while measurements show snowpack levels to be at 119 % of the 30-year average.





SAN FRANCISCO - UPPER GILA RIVER BASIN
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (1000AF)	50% (% MED.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Gila River at Gila							
JAN-MAY	47	66	81	135	99	129	60
Gila River nr Virden							
JAN-MAY	46	81	105	127	129	166	83
San Francisco River at Glenwood							
JAN-MAY	23	31	37	137	44	56	27
San Francisco River at Clifton							
JAN-MAY	26	62	87	124	112	147	70
Gila River nr Solomon							
JAN-MAY	60	150	210	127	270	360	165
JANUARY			80	406		0.0	19.7
San Carlos Reservoir inflow							
JAN-MAY	55	115	160	167	205	265	96

* 90%, 70%, 50%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.
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SAN FRANCISCO - UPPER GILA RIVER BASIN
Reservoir Storage (1000AF) End of December

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
SAN CARLOS	875.0	24.1	27.3	379.1

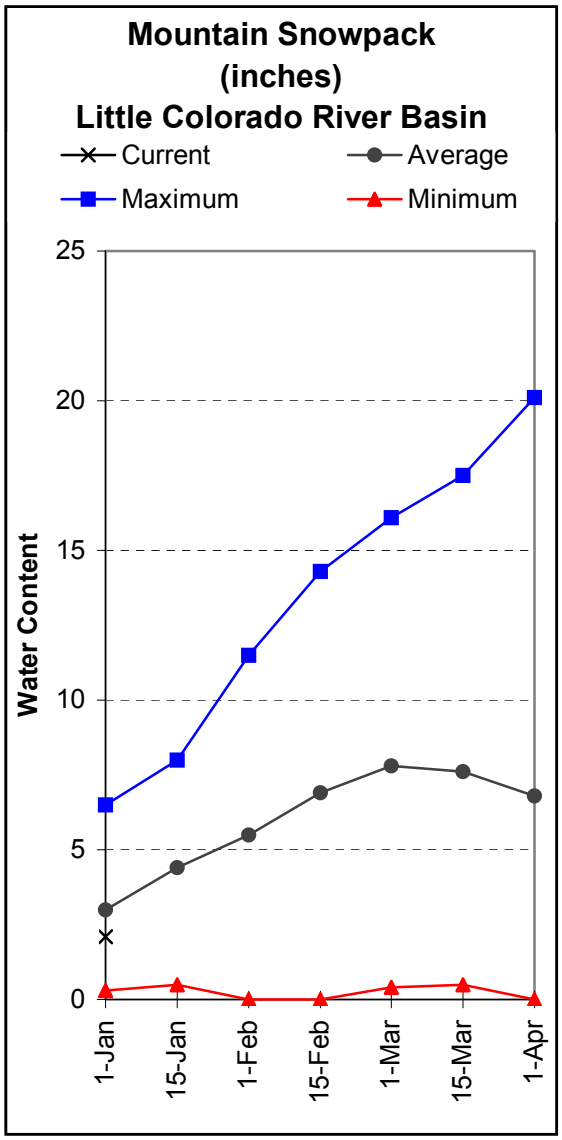
SAN FRANCISCO - UPPER GILA RIVER BASIN
Watershed Snowpack Analysis - January 1, 2005

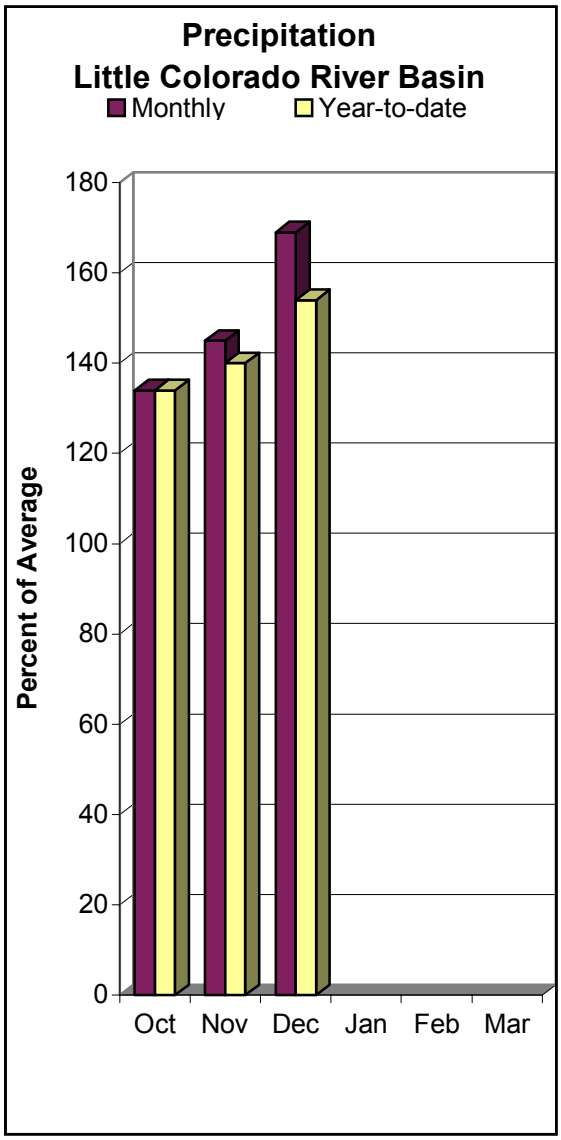
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
SAN FRANCISCO - UPPER GILA R	11	456	119

LITTLE COLORADO RIVER BASIN as of January 1, 2005

Near median streamflow levels are forecast for the basin. In the Little Colorado River, at Lyman Lake, the forecast calls for 101 % of median streamflow levels through JUNE, while at Woodruff, the forecast calls for 92 % of median streamflow levels through MAY.

Additionally, snowpacks along the southern headwaters of the Little Colorado River, and along the central Mogollon Rim, were measured at 70 % and 87 % of the 30-year average, respectively.





LITTLE COLORADO RIVER BASIN
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === Future Conditions === Wetter ===> Chance of Exceeding * 90% (1000AF)	70% (1000AF)	50% (1000AF)	50% (% MED.)	30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Little Colorado River abv Lyman Lake							
JAN-JUN	2.37	4.96	7.50	101	10.79	17.20	7.40
Rio Nutria nr Ramah							
JAN-MAY	0.99	1.55	2.30	74	4.60	8.70	3.10
Ramah Reservoir inflow							
JAN-MAY	0.60	0.94	1.27	74	2.60	3.80	1.71
Zuni River abv Black Rock Reservoir							
JAN-MAY	0.48	0.81	1.10	74	1.46	2.10	1.48
Little Colorado River at Woodruff							
JAN-MAY	1.01	1.80	3.30	92	5.50	8.60	3.60
Blue Ridge Reservoir inflow							
JAN-MAY	7.0	13.0	18.1	106	24	34	17.1
Lake Mary inflow							
JAN-MAY	2.00	4.52	5.60	112	6.85	9.50	5.00

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LITTLE COLORADO RIVER BASIN
Reservoir Storage (1000AF) End of December

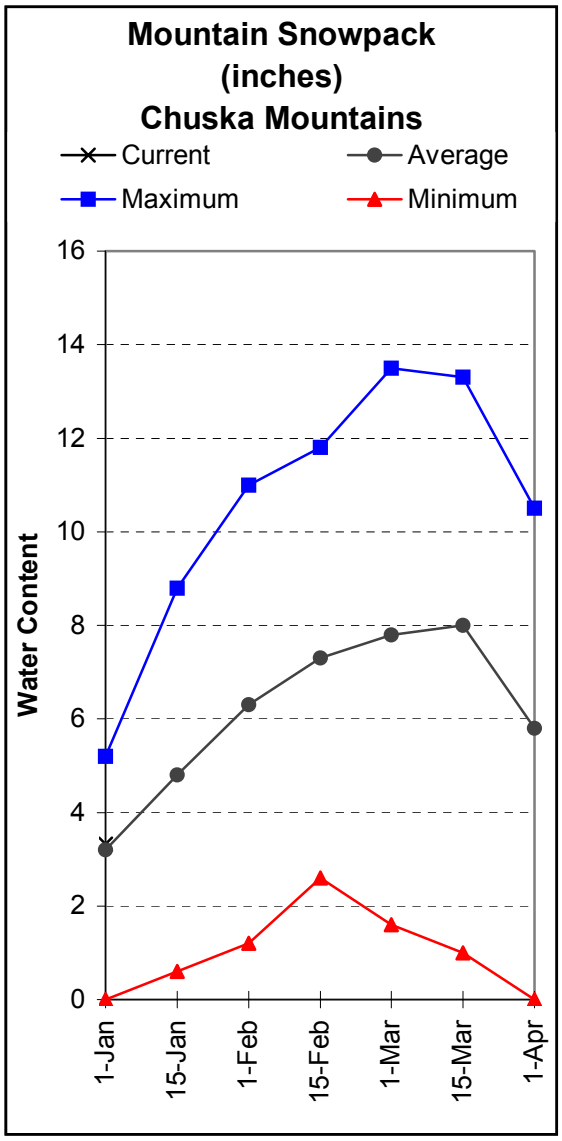
Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
LYMAN RESERVOIR	30.0	2.6	2.0	14.1
SHOW LOW LAKE	5.1	2.8	3.1	3.1

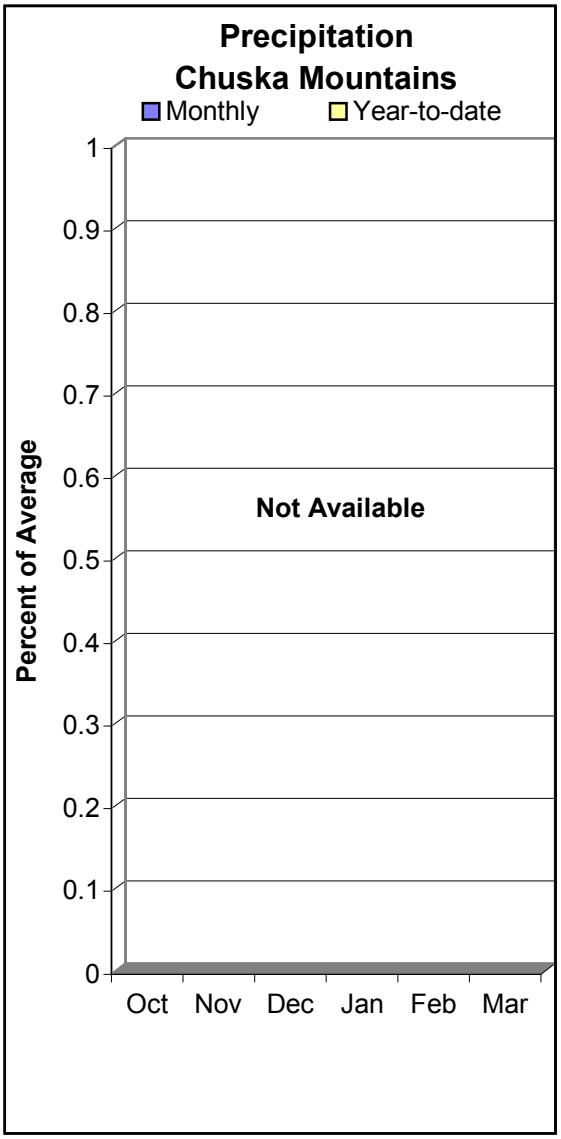
LITTLE COLORADO RIVER BASIN
Watershed Snowpack Analysis - January 1, 2005

Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
LITTLE COLORADO - SOUTHERN H	9	208	70
CENTRAL MOGOLLON RIM	4	249	87

CHUSKA MOUNTAINS as of January 1, 2005

Snow survey measurements conducted by staff of the Navajo Tribe show the Chuska snowpack to be 104 % of average, while near average runoff is forecast for Captain Tom Wash, Wheatfields Creek, and Bowl Canyon Creek.





CHUSKA MOUNTAINS
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (1000AF)	50% (% AVG.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Avg (1000AF)
Captain Tom Wash nr Two Gray Hills							
MAR-MAY	0.57	1.30	3.00	106	4.70	7.30	2.83
Wheatfields Creek nr Wheatfields							
MAR-MAY	0.29	1.20	3.00	103	4.80	7.40	2.90
Bowl Canyon Creek abv Assayi Lake							
MAR-MAY	0.10	0.44	1.05	105	1.67	2.57	1.00

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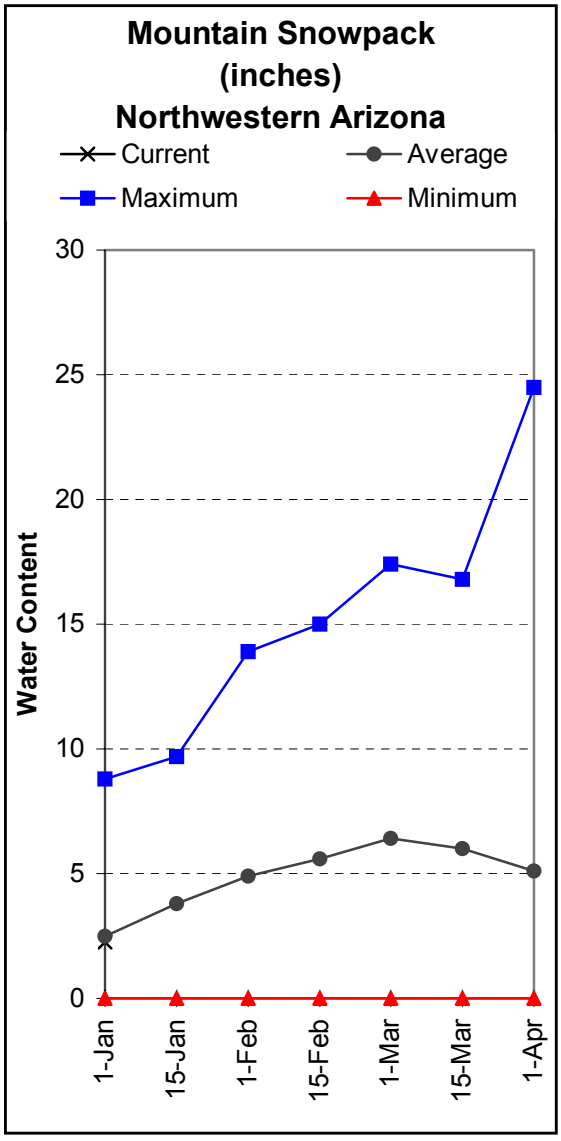
CHUSKA MOUNTAINS
Watershed Snowpack Analysis - January 1, 2005

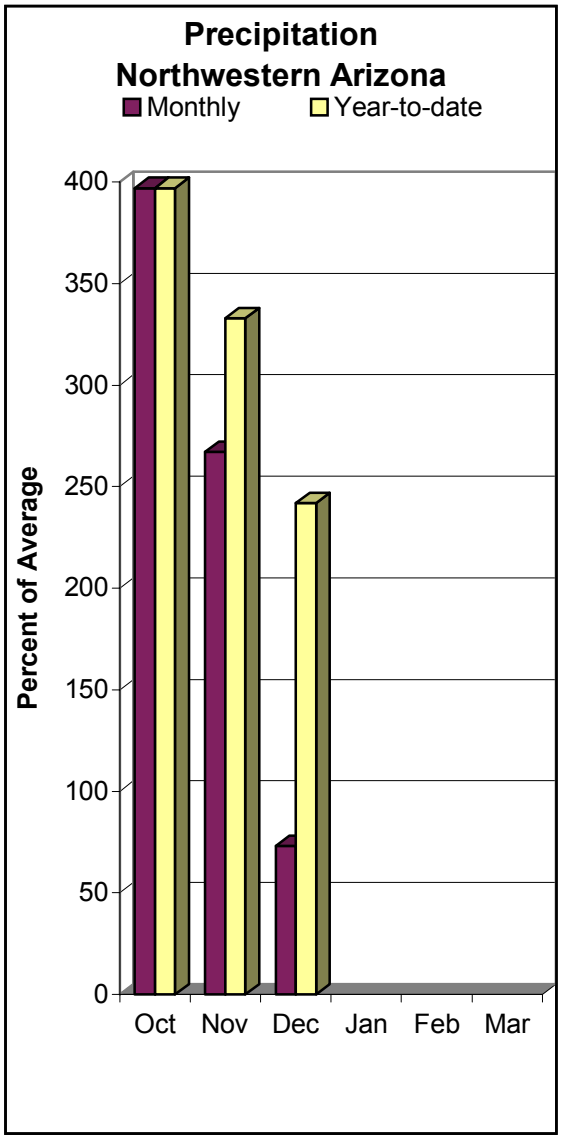
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
CHUSKA MOUNTAINS	7	151	104
DEFIANCE PLATEAU	2	56	38

NORTHWESTERN ARIZONA as of January 1, 2005

On the Colorado River, inflow into Lake Powell is forecast at 98 % of the 30-year average APR-JULY, while at Littlefield, the Virgin River is forecast at 176 % of the 30-year average.

At the Grand Canyon, measurements conducted by the National Park Service show the snowpack to be at 85 % of the 30-year average.





NORTHWESTERN ARIZONA
Streamflow Forecasts - January 1, 2005

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (1000AF)	50% (% AVG.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Avg (1000AF)
Virgin River at Littlefield							
APR-JUL	43	96	130	176	148	215	74
Lake Powell inflow							
APR-JUL	4320	6390	7800	98	9210	11280	7930

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NORTHWESTERN ARIZONA
Reservoir Storage (1000AF) End of December

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
LAKE HAVASU	619.0	560.4	516.2	556.4
LAKE MOHAVE	1810.0	1632.6	1590.3	1596.6
LAKE MEAD	26159.0	14355.0	15300.0	21775.0
LAKE POWELL	24322.0	8664.0	11487.0	18933.0

NORTHWESTERN ARIZONA
Watershed Snowpack Analysis - January 1, 2005

Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
GRAND CANYON	1	269	90

S N O W S U R V E Y D A T A

JANUARY 1, 2004

SNOW COURSE	ELEV.	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 71-00
ARBABS FOREST (AK)	7680	1/03	3	.2	0.8	1.2
BAKER BUTTE SNOTEL	7330	1/01	4	1.4	0.3	2.3
BAKER BUTTE #2	7700	12/28	15	5.1	1.2	4.3
BALDY SNOTEL	9220	1/01	5	2.8	1.5	3.5
BEAVER HEAD	8000	12/30	4	1.4	0.4	1.6
BEAVER HEAD SNOTEL	7990	1/01	7	3.0	1.7	1.9
BEAVER SPRING	9220	1/06	22	5.4	2.6	3.9
BRIGHT ANGEL	8400	12/30	12	3.5	1.3	3.9
BUCK SPRING	7400	12/29	0	0.0	0.4	2.7
CHALENDER	7100	12/29	0	0.0	0.3	1.3
CHEESE SPRINGS	8600	12/28	7	1.2	1.1	2.5
CORONADO TRL SNOTEL	8400	1/01	4	2.9	0.7	1.8
CORONADO TRAIL	8350	12/30	0	0.0	0.3	1.6
FLUTED ROCK	7800	1/03	4	.8	1.0	1.4
FORT APACHE	9160	12/28	11	2.5	1.3	3.8
FORT VALLEY	7350	12/29	2	0.8	0.4	1.2
FRY SNOTEL	7220	1/01	11	4.2	1.4	2.8
GRAND CANYON	7500	1/07	10	1.2	0.5	1.6
HANNAGAN MDWS SNOTEL	9020	1/01	24	6.8	2.1	5.5
HAPPY JACK	7630	12/28	6	2.0	0.6	2.0
HAPPY JACK SNOTEL	7630	1/01	8	3.3	0.9	2.1
HEBER SNOTEL	7640	1/01	0	1.2	1.2	2.3
LAKE MARY	6930	12/28	3	1.1	0.3	1.5
MAVERICK FORK SNOTEL	9200	1/01	13	4.0	1.3	4.2
MORMON MTN SNOTEL	7500	1/01	11	3.9	0.8	2.4
MORMON MT. SUMMIT #2	8470	12/28	19	5.0	2.1	1.1
NEWMAN PARK	6750	12/29	1	0.3	0.2	.9
NUTRIOSO	8500	12/30	0	0.0	0.3	1.0
PROMONTORY SNOTEL	7900	1/01	10	4.0	2.0	4.6
SNOW BOWL #1 ALT.	10260	12/30	58	16.8	1.4	5.7
SNOW BOWL #2	11000	12/30	35	8.8	2.6	9.0
SNOWSLIDE CYN SNOTEL	9750	1/01	50	15.0	6.5	7.0
TSAILE CANYON #1	8160	1/04	12	2.8	1.8	2.6
TSAILE CANYON #3	8920	1/04	20	4.6	3.1	3.6
WHITE HORSE SNOTEL	7180	1/01	2	.6	0.4	2.0
WILDCAT SNOTEL	7850	1/01	1	.3	1.2	1.7
WILLIAMS SKI RUN	7720	1/03	16	4.5	1.8	3.5
WORKMAN CREEK SNOTEL	6900	1/01	2	1.0	1.5	2.9